REMARKS

Prior to entry of this Amendment, claims 1-9 are pending in the application. Applicants hereby amend claims 1 and 4-9 and cancel claims 2 and 3 without prejudice. New claims 10-15 are added. Upon entry of this Amendment, claims 1 and 4-15 are pending and presented for consideration.

Claim 1 has been amended to better describe the invention. Specifically, the subject matter of claim 2 has been incorporated into amended claim 1. Minor editorial changes have been made to claims 4-9 to correct typographical errors and/or to conform to U.S. practice. The amendments are fully supported by the originally filed claims and specification. No new matter is added thereby.

Support for new claims 10 and 15 can be found at least in originally filed claim 1. Support for new claim 11 can be found at least in originally filed claim 2. New claims 12 and 13 are supported by the last paragraph of page 5, the last paragraph of page 9 and Fig. 7 in the specification. Support for new claim 14 can be found at least in the third paragraph of page 9 in the specification.

Claim Rejections Under 35 U.S.C. § 112, Second Paragraph

Claims 1–9 are rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicants regard as the invention. Specifically, the action alleges that the language "some W" in claim 1 is unclear. Additionally, "movemenets" in claim 2 is incorrectly spelled. Without acquiescing to the propriety of the rejections, claim 1 has been amended and claim 2 canceled. Applicants submit that the rejections have been rendered moot.

Claim Rejections Under 35 U.S.C. § 103

Claims 1–9 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 4,710,605 ("Presby") in view of U.S. Patent No. 5,457,567 ("Shinohara"). Claims 7 and 9 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Presby in view of Shinohara, and further in view of U.S. Patent No. 4,467,168 ("Morgan et al."). Applicants respectfully traverse these rejections.

The action misreads Presby and incorrectly concludes that Presby discloses the substantial limitations of the claims. Presby discloses a method for micromachining an optical fiber using CO_2 laser radiation. Presby's method is concerned with how to process optical fibers, especially how to expose the fiber core, for optical coupling. Particularly, the invention is described as an alternative to the lapping process in which "the side of the cladding is abraded away to expose the core so that the core may be placed in close proximity to another, similarly exposed core" (col. 1, lines 35-38). Presby's invention, therefore, is a method of removing "material along the circumferential edge" of an optical fiber to "permit[] precise access to and shaping of the fiber core region" (claim 1 and col. 1, lines 51-52). In other words, Presby does not disclose or suggest a method for cutting light-conducting fibers as recited in amended claim 1.

Even if Presby's invention can be applied to cut through light-conducting fibers, the manner in which it is carried out differs from Applicants' invention in at least the following ways. For example, Presby's method requires that the optical fiber is exposed to only a portion of the cross-section of the pulsed laser beam (see col. 1, lines 45-46). This means that only part of the laser energy is used to ablate fiber material. In contrast, claim 1 requires the step of "moving the operative beam back and forth in a plane along a working zone." This means that the fiber is fully exposed to the cross section of the beam (see Fig. 4 of the specification) and the entire laser energy is used. In addition, Presby's invention requires that the waveguide is brought gradually up into the beam to utilize the edges of the beam to perform micromachining (see col. 3, lines 1-5). In contrast, claim 1 requires the step of "focusing the operative beam on a fixed light-conducting fiber." Last but not least, the limitation introduced by this amendment in claim 1, i.e., the step of "providing a cooling phase between each back and forth movement of the beam" also is not disclosed or suggested in Presby.

Shinohara was cited in the action to provide disclosure of a modulator and a light trap. Morgan et al. was cited in the action to provide disclosure of using gas at the laser nozzle for cutting glass. Since such disclosure does not cure the deficiencies of Presby, rejections of amended claim 1 and claims dependent therefrom based on Shinohara and/or Morgan et al. in view of Presby cannot be sustained. Further, given that the method disclosed in Presby has a completely different objective from Applicants' invention as described above, there is no

motivation for a person skilled in the art to modify the teachings of Presby to come up with Applicants' claimed invention. Accordingly, Applicants submit that the claimed invention recited in amended claim 1 is neither anticipated nor made obvious by Presby, Shinohara and/or Morgan et al., alone or in proper combination.

In addition to the differences in the manner in which Applicant's invention and Presby's method are carried out, the two methods also are derived from different theoretical considerations. Because Presby's invention is mainly concerned with removing circumferential material to expose the core of the fiber for optical coupling, parameters such as the energy intensity of the beam and pulse duration are adjusted "so that the workpiece is progressively ablated without redeposition of the ablated material and without distortion of the remaining workpiece geometry" (col. 1, lines 46-50). As demonstrated by equation (2) at column 2, line 54 in Presby, the disclosed method is dictated by the thermal properties of the fiber material (see also col. 2, line 13 to col. 3, line 1). Contrary to Presby's thermal conductivity-controlled method, Applicants' invention is based on considerations that can lead to a high degree of planar uniformity at the cut surfaces. Applicants have discovered that by applying laser radiation on a fiber in an optical absorption-controlled manner, such objective can be achieved. (See p. 1, second paragraph, of the specification).

That Applicants' invention is an optical absorption-controlled method instead of a thermal conductivity-controlled method is highlighted by the definition of "elementary volume" as recited in amended claim 1. Elementary volume is defined in the specification and in amended claim 1 as the product of the optical penetration depth (d) into the fiber material and the cross section area of the beam. As known by those skilled in the art, the optical penetration depth is inversely proportional to the linear absorption coefficient α, a wavelength-dependent constant, of the processed material. To remove such an elementary volume of fiber material by a single pulse of radiation, a precisely defined amount of pulse energy has to be applied. The energy of a pulse, as known by those skilled in the art, is obtained by the product of the duration τ_{imp} of the pulse and the peak power $\hat{P}$ of the pulse. Given that none of the three references cited in the action discloses or suggests how to remove elementary volumes of fiber material using pulsed radiation, Applicants submit that the cutting method recited in amended claim 1 is not obvious in light of the cited references because of this limitation alone.

CONCLUSION

In light of the foregoing amendments and remarks, Applicants submit that claims 1 and 4-15 are in condition for allowance. If the Examiner believes that a telephone conversation with Applicants' attorney would expedite allowance of this application, the Examiner is cordially invited to call the undersigned attorney.

Respectfully submitted,

Date: February 7, 2006
Reg. No. 39,061

Christine C. Vito
Attorney for the Applicants
Kirkpatrick & Lockhart Nicholson Graham LLP
75 State Street
Boston, Massachusetts 02109-1808

Tel. No.: (617) 261-3150
Fax No.: (617) 261-3175

931707